Analysis of a Corona-Discharge Based Electrostatic Motor

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Abstract:

This paper is aimed at proposing a new design of a corona-discharge based electrostatic motor with a cylindrical rotor made from aluminum foil and multi copper strip stator electrodes. The stator electrodes are alternately stressed positively and negatively. The onset voltage of corona discharge is calculated based on the condition of discharge sustenance at stator electrodes. The corona currents emitted from positively and negatively stressed electrodes are calculated being dependent on the applied voltage and motor geometry. This calls at first for calculation of the spatial distribution of electric field within the motor volume using the accurate charge simulation technique. The calculated corona onset voltage and current-voltage characteristics of the motor agreed reasonably with those measured experimentally for three motors built-in the laboratory. The dependency of the motor speed on the applied voltage is reported for the different investigated motors.

Keywords:

Electrostatic motor, ionic wind, corona-discharge, field mapping, corona current, motor speed

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